Spectral Study of Water Tracks as an Analog for Recurring Slope Lineae. L. Ojha[1*] & M. B. Wilhelm[2,1*], J. J. Wray[1]. [1]Georgia Institute of Technology, Atlanta, GA; [2]NASA Ames Research Center, Moffett Field, CA *(luju@gatech.edu, mbwilhelm@gatech.edu).

Introduction: Liquid water is a key requirement for life on Earth, and serves as an important constraint on present day habitability on Mars. Recurring Slope Lineae (RSL) are a unique phenomenon on Mars that may be formed by brine seeps. Their morphological, seasonal and temporal characteristics support this hypothesis [1-3]; however, spectral evidence has been lacking. *Ojha et al.,* 2013 [4] recently analyzed CRISM images from all confirmed RSL in the southern mid-latitudes and equatorial regions and found no spectroscopic evidence for water. Instead, enhanced abundances or distinct grain sizes of both ferric and ferrous minerals are observed at most sites. The strength of these spectral signatures changes as a function of season, possibly indicating removal of a fine-grained surface component during RSL flow, precipitation of ferric oxides, and/or wetting of the substrate.

Water tracks (WT) have been suggested as a terrestrial analog for RSL by *Levy et al.,* 2011 [5]. WT are defined as dark surface features that extend downslope in a linear or branching fashion, usually oriented along the steepest local gradient, in the Dry Valleys of Antarctica. They can be 1-3 m in width and can have lengths up to 2 km. They share many morphological and seasonal characteristics with RSL including active growth during summer seasons and fading during winter [5]. Snowmelt, ground ice melt and deliquescence by hygroscopic salts have been suggested as possible formation mechanisms for water tracks [5]. No spectral work to date has been reported for water tracks.

Analog Study Description: We propose to perform a three-part spectral investigation to determine both the mineralogical and biologic signature of Antarctic water tracks for comparison to the recent spectral analysis of RSL and to inform future remote sensing and rover exploration of Mars. This will involve the use of Earth-orbiter multispectral images, in-situ spectral measurements of WT at high temporal resolution to understand spectral behavior as a function of volumetric water content (VWC) and season, and Raman analysis of potential organic biomarkers to investigate organic deposition, preservation, and detection potential of RSL analogs with field-rated instrumentation.

(1) Remote Sensing: Panchromatic and multispectral images acquired through high resolution Earth orbiters (e.g. World View-1 with maximum multispectral resolution of 1.65 m) will be used to: **(a)** detect possible water related signatures in WT spectra and **(b)** study putative temporal variations in the spectra of WT as a function of season and VWC. This will help us understand why water bands are not detected in even the widest of RSL. A possible reason we do not detect H_2O absorptions in RSL is that MRO acquires images of Mars in the late afternoon (~3PM), by which time RSL may have largely dried due to low humidity, while nevertheless retaining their dark appearance [6]. By studying the variation in spectra of WT as a function of time, we will be able to test this hypothesis.

(2) In-Situ Mineralogical Analysis: In-situ infrared measurements of WT with a field-rated spectrometer will also be acquired to establish the relationship between VWC and spectral signatures. This analysis can serve as an important ground truth of remote spectral observations and can be coupled to further micro- and meso-scale geologic observations.

(3) Raman Organic Analysis: *Levy and Fountain*, 2011 [7] found that organic matter is more abundant (up to 5 times more) in water track soils than in adjacent dry soils. We propose to do a detailed field investigation of biomarkers present over time on and off water track soils and with depth using a field-rated Raman system. Samples will be collected for a later, more detailed analysis with a GC-MS system to compare with Raman field results to determine the viability of using such systems as a primary biomarker detection and characterization tool. Furthermore, Raman and infrared spectroscopic investigations can be coupled, and can inform the use of these systems in tandem to identify sites with the highest organic concentration and preservation potential.

Scientific Merit & Application to Mars: The seasonal, temporal and geomorphic characteristics suggest that RSL are formed by brines. Spectroscopic evidence has previously been lacking, but there now appears to be a diagnostic, consistent spectral signature associated with RSL slopes [4]. The proposed work will aid in the understanding of spectral characteristics observed on RSL slopes and will inform potential future biomarker identification. If RSL are confirmed to be due to brines, it will prove pivotal for the future exploration of Mars, both in terms of astrobiology and resource availability for potential human missions.

References: [1] McEwen A. S. et al. (2011) Science, 333, 740–743. [2] Ojha L. et al. (2012) LPS XLIII, Abstract #2591. [3] McEwen A. et al. (2012) AGU Fall Meeting, Abstract #P21C-1857. [4] Ojha L. et al. (2013) LPS XLIV, Abstract #2423. [5] Levy et al. (2011), GSA Bulletin, V. 123, No. 11-12, P2295-2311. [6] Massé M. et al. (2012) LPS XLIII, Abstract #1856. [7] Levy & Fountain. (2011) LPSXLII, Abstract#1210.